

AMENDMENTS TO THE DRAWINGS

The attached sheet of drawings includes changes to Fig. 1 (formerly Fig. 1A) and removes Fig. 1B. This sheet replaces the original sheet that included Figs. 1A and 1B. Since Fig. 1B has been deleted, Fig. 1A has been renumbered FIG. 1.

Attachment: Replacement Sheet
Annotated Sheet Showing Changes

REMARKS

Claims 1-44 are pending in the application.

Claims 1-44 stand rejected.

Claims 1, 20, 28, 34, 38, and 40 have been amended. Support for the amendments to claims 1, 20, 28, 38, and 40 can be found, at least, in Figs. 2A, 2B, 3, 4, and 5 of the present application.

Formal Matters

The drawings are objected to because the sectional views are not properly crosshatched. The figure containing crosshatching has been removed, as shown in the attached replacement sheet.

Rejection of Claims under 35 U.S.C. §112

Claim 34 stands rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Claim 34 has been amended to correctly depend from claim 33. Accordingly, Applicant believes that this rejection is moot.

Rejection of Claims under 35 U.S.C. §102

Claims 1, 2, 4, 7-12, 14-18, 20, 21, 25, 26, 28, 29, and 35-44 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Beale, et al., U.S. Patent Publication No. 2005/007797 A1 (hereinafter referred to as "Beale").

With respect to amended claim 1, the cited art does not anticipate, teach, or suggest a printed circuit board that includes:

- a first pair of vias in the substrate; and
- a second pair of vias in the substrate; wherein

the first pair of vias is configured to convey a first signal pair and the second pair of vias is configured to convey a second signal pair;
the first pair of vias is positioned in a first plane,
each point in the first plane is substantially equidistant from each via in the second pair of vias,
the second pair of vias is positioned in a second plane,
each point in the second plane is substantially equidistant from each via in the first pair of vias.

The cited portions of Beale do not teach or suggest the features of claim 1. As shown in Fig. 4A of Beale, vias 14 and 18, which convey differential signal pair 10a, are located in a plane that is parallel to the plane containing vias 24 and 28, which convey differential signal pair 10b. Accordingly, each point in the plane that includes vias 14 and 18 is not equidistant from each of vias 24 and 28. For example, via 14 (which is a point in the plane that includes vias 14 and 18) is not equidistant from vias 24 and 28. Instead, via 14 is closer to via 24 than it is to via 28. No other arrangement of vias is taught or suggested in the cited portions of Beale.

For at least the foregoing reason, the cited art fails to anticipate, teach, or suggest claim 1. Dependent claims 2, 4, and 7-12 are patentable over the cited art for at least the foregoing reason. Claims 20, 21, 25, 26, 28, 29, and 35-44 are patentable over the cited art for similar reasons.

With respect to claim 14, the cited art does not teach or suggest a printed circuit board comprising:

- a first pair of vias in the substrate; and
- a second pair of vias in the substrate, wherein
 - the first pair of vias is configured to convey a first signal pair comprising a first positive signal and a first negative signal,
 - the second pair of vias is configured to convey a second signal pair comprising a second positive signal and a second negative signal, and
 - the first pair of vias is positioned relative to the second pair of vias such that a crosstalk effect caused by the first signal pair on the second positive signal reduces a crosstalk effect caused by the first signal pair on the second negative signal.

. . . .

As shown in Fig. 3 of Beale and described in the corresponding description, the arrangement of vias at both ends of the signal lines affects the crosstalk between the two signal pairs. For example, at one end, via 14 is located close enough to via 24 that signal 12 (conveyed by via 14) and signal 22 (conveyed by via 24) will experience electrical coupling. At the other end, via 16 (which also conveys signal 12) is located close enough to via 30 that signal 12 (conveyed by via 16) and signal 22' (conveyed by via 30) will experience electrical coupling. See also Beale, paragraphs 35-37. Accordingly, four pairs of vias (two pairs at each end) are used to achieve the electrical coupling between the different signals that ultimately reduces the effects of crosstalk in Beale's system.

In other words, the impact of crosstalk between signals conveyed via a set of two pairs of vias (e.g., vias 14 and 18 and vias 24 and 28) in Beale's system are substantially canceled out by the impact of crosstalk at the other set of two pairs of vias (e.g., vias 16 and 20 and vias 26 and 30). "As such, in operation, the amount or impact of crosstalk between signal lines 12 and 22 (at vias 14 and 24) is equal or substantially equal to the crosstalk between signal lines 12' and 22 (at vias 20 and 26). Similarly, the amount or impact of crosstalk between signal lines 12 and 22' (at vias 16 and 30) is equal or substantially equal to the crosstalk between signal lines 12' and 22' (at vias 18 and 28). As coupling is reciprocal, the equal or substantially equal coupling exists between signal lines 22/22' to signal lines 12/12' such that any difference in coupling between signal lines 22/22' to 12/12' is negligible (or not detrimental) to the operation of the communications system." Thus, the reduction of the crosstalk in Beales system depends on the arrangement of four pairs of vias.

In contrast, in claim 14, a first pair of vias is configured to convey the first signal pair comprising a first positive signal and a first negative signal, and the second pair of vias is configured to convey a second signal pair comprising a second positive signal and a second negative signal. The first pair of vias is positioned relative to the second pair of vias such that a crosstalk effect caused by the first signal pair on the second positive signal reduces a crosstalk effect caused by the first signal pair on the second negative signal. Thus, in claim 14, two pairs of vias are arranged so that crosstalk effects on one signal within a pair reduce the crosstalk effects on the other signal within the pair. Such an arrangement of vias is not shown in the cited portions of Beale which, as described above, requires four pairs of vias to obtain desired

crosstalk reduction, rather than the simpler arrangement of two pairs of vias used by the claimed invention.

Rejection of Claims under 35 U.S.C. §103

Claims 3, 19, 22, 33, and 34 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Lee, U.S. Patent Publication No. 2004/0150970 A1 and Fulcher, U.S. Patent No. 6,008,534. Claims 5 and 6 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Cotton, U.S. Patent Publication No. 2002/0130739 A1. Claims 13, 23, 27, and 30 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Beale, et al., U.S. Patent Publication No. 2005/007797 A1. Claims 24, 31, and 32 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Beale, et al., U.S. Patent Publication No. 2005/007797 A1, as applied to claims 23 and 30 above, and further in view of Cotton, U.S. Patent Publication No. 2002/0130739 A1. Applicants respectfully traverse these rejections, for at least the foregoing reasons set forth above with respect to claim 1.

CONCLUSION

In view of the amendments and remarks set forth herein, the application is believed to be in condition for allowance and a notice to that effect is solicited. Nonetheless, should any issues remain that might be subject to resolution through a telephonic interview, the Examiner is invited to telephone the undersigned at 512-439-5087.


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Respectfully submitted,



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